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UNITED STATES DEPARTMENT OF AGRICULTURE  
Food Distribution Administration

USE BY THE COTTON INDUSTRY OF THE FIBER AND  
SPINNING TESTING SERVICE 1/

The cotton fiber and spinning testing service of the U. S. Department of Agriculture, as authorized by Congress 2/, is proving its worth by facilitating improvement in the quality of the American cotton crop and aiding cotton breeders, producers, manufacturers, and merchants in solving their problems of cotton quality. The testing service provides means whereby cotton breeders and others may obtain information with respect to the physical properties of their cottons, their manufacturing performance, and the relationship between fiber properties and manufacturing performance. The volume of service testing has shown a continuous increase since the work was first started in 1941. At present 24 different types or combinations of tests, ranging from simple tests of fiber properties to combined fiber and spinning tests of both carded and combed yarns, are provided. The tests are made on a fee basis in well-equipped laboratories located at Washington, D. C., Clemson, S. C., Stoneville, Miss., and College Station, Tex.

As this service has become more extensively used, questions have been raised with regard to the practicable use of laboratory fiber and spinning test results. Some of the more important questions are as follows:

1. Are equipment and methods used in the Department's laboratories comparable with those of other laboratories and with commercial practice in cotton manufacturing?

2. What practical use can cotton breeders make of test results?

3. How can the service assist the cotton merchant?

4. How do laboratory results on spinning tests compare with actual mill results?

5. How can the testing service be used in helping to solve mill problems?

6. How can it be used to aid manufacturers in obtaining the most desirable cottons for specific uses?

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1/ Prepared in the Research and Testing Division, Cotton and Fiber Branch, Food Distribution Administration.

2/ Act of April 7, 1941 (Public 30 - 77th Congress).

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Testing Equipment and Methods. - Fiber and yarn tests are made in accordance with standard testing methods under controlled atmospheric conditions on instruments which have been well proved. Fiber length is determined either by the array or fibrograph method, the array serving also as a basis for fiber weight per unit of length (fineness) and fiber maturity tests. Fiber strength is determined either by the Fressley tester, or by the Chandler round bundle method.

Statistical analyses have shown definite relationships between fiber properties and the spinning performance of cottons. Data with respect to such fiber properties as length, length distribution, fineness, maturity, and tensile strength will in most cases give a good indication of manufacturing value. Because many users are not thoroughly familiar with the fiber and spinning test results, reports are made in simple non-technical terms insofar as possible. A pamphlet describing the various tests and the meaning of their results has been published by the Department under the title "Cotton Fiber Testing Service" and is available upon request.

Regular commercial design picking, carding, drawing, roving, spinning, and combing machines are used for the processing tests. A standard manufacturing set-up which varies only with the staple length of the cotton is used by the laboratories. Roll settings and twists used are those which former tests have shown will result in the maximum yarn skein strength for cotton of a given staple length. Thus, the results for the optimum product made from each cotton may be subjected to direct comparisons with results from other tests.

Some question has been raised as to the reliability of the small lot technique in giving representative manufacturing waste and yarn strength results. The laboratory practice of employing 5 pounds of cotton for a spinning test has proved to be thoroughly practicable, and shows satisfactory comparability with commercial lots both from the standpoint of yarn strength and waste. Careful analyses by mills using the service have shown that results obtained in commercial practice may be above or below those obtained in the laboratory but laboratory and mill results are consistent on a relative basis.

Use by Cotton Breeders. - The fiber and spinning testing service is proving invaluable to breeders, for several reasons. Formerly, it was necessary for a breeder to spend several years multiplying what was thought to be a promising variety in order to provide sufficient lint for a mill run. With this service, and because of the definite relationship between fiber properties and spinning performance, a breeder may now submit samples of only a few ounces for fiber tests and obtain a good index of quality. From these fiber tests he may then select for increase those cottons which offer the greatest possibilities and proceed with spinning tests on as

little as 5 pounds of lint. The tests also enable the breeder to determine small differences which are not discernible by the usual methods of measurement. The results, therefore, serve as a basis for selecting strains to multiply, and as a basis for dropping those showing little promise.

In some cases breeders have spent years developing varieties with certain properties thought to be desirable, but which were found to be undesirable when the cotton reached the mills. By using the testing service, undesirable strains can be discovered and discarded the first year, thus resulting in considerable saving of time, money, and effort for the cotton breeder as well as the farmer. This is particularly important under existing conditions as it makes available to farmers seed of the improved varieties that will produce cotton of the kinds needed for the manufacture of superior cotton goods for the armed services. Another advantage to the breeder lies in the fact that by having spinning tests performed he can present the results to merchants and spinners in their own language.

Use by Cotton Merchants. - Cotton merchants and other marketing agencies are steadily increasing their use of the testing service. By having a knowledge of the fiber and spinning characteristics of cottons of different varieties and growths, they are able to buy more intelligently and to group bales for specific purposes demanded by their mill customers. Merchants are finding it advantageous to have tests made on their own private "types" and on mill "types" against which they are supplying cotton so as to provide them with complete information with respect to the fiber properties and spinning performance of such types. Where merchants assume the responsibility of guaranteeing good manufacturing performance to their mill customers, the tests provide a means of ascertaining the performance to be expected. Cotton can thus be assembled in lots which are even running in spinning performance.

The element of variety is beginning to influence marketing methods in an important way, and knowledge of the fiber characteristics typical of certain varieties may prove helpful in assembling lots for specific purposes. As the varieties having superior spinning quality come to be recognized by manufacturers and merchants, the demand for those varieties will increase and producers will be benefited accordingly.

Use by Cotton Manufacturers. - Cotton manufacturers are taking increased interest in the testing service because it has been demonstrated that laboratory results can be interpreted in terms of mill results. Certain differences in the level of laboratory and mill results are to be expected because of the wide diversity of manufacturing methods and practices. Likewise there are differences between the level of results at different commercial mills. Because the results are relative, however,



conclusions are usually the same whether the test is performed in the mill or in the laboratory. As an example, the following figures will serve to illustrate the results of a comparative mill and laboratory test on three different blends. Skein strengths of 14s carded warp yarns as manufactured and tested in the laboratory were 165, 158, and 150 pounds for blends 1, 2, and 3, respectively. As spun and tested in the mill they were 137, 134, and 130 pounds in the same order. Yarn appearance grades for the three counts of yarn manufactured in the laboratory were B, B, and B and for the mill yarns they were C+, C+, and C+. It is obvious in this case that, although there was a decided difference in level for both strength and appearance, the three blends held the same relationship to each other whether manufactured in the laboratory or in the mill. In other words, the same conclusions with respect to the comparative qualities of the three blends could logically be drawn in each case.

In some cases mills have submitted cottons for testing, representing specific mill or merchants' "types," and have found that the laboratory results were reliable in determining quality differences and as a basis for selecting the cottons most suitable for their particular uses. Instances can be cited wherein mills have found it possible to use shorter staple cotton at considerable saving in cost and still maintain the quality of their manufactured goods. In such instances purchases have been made on the basis of specific varieties and growths.

The problem of comparability of laboratory and mill tests is being successfully met by some spinners by submitting samples to the laboratory which are representative of their regular mix, for which they already have mill results, along with samples of other cottons for which they wish to know the comparative manufacturing value. By having laboratory data for their regular mix as well as for the new cottons under test, the laboratory data can readily be evaluated in terms of mill results. This service has been particularly useful to mills manufacturing military fabrics for which very high standards of strength and appearance must be met.

#### Relation to Federal-State Breeding and Improvement Program. -

Cotton manufacturers who use the service have found that, after they have once established the difference in level between yarns manufactured in the laboratory and their own mill, they are able to evaluate for their own purposes the relative merits of the different varieties and growths of cotton being tested each year in connection with the Federal-State cotton breeding and improvement program, the results of which are published by the Department.

These annual tests of leading commercial varieties of cotton and of new strains being developed, and the data published with respect to them, provide a basis of comparison for cotton breeders who have had their own varieties and strains of cotton tested. Likewise, they enable cotton merchants who have had tests on their own or mill types to ascertain which varieties and growths possess fiber properties corresponding with such types.

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